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A.D. 1868, 29th August. N° 2683.

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### Electric Telegraphs.

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**LETTERS PATENT** to Cromwell Fleetwood Varley, of Beckenham, in the County of Kent, for the Invention of "**IMPROVEMENTS IN ELECTRIC TELEGRAPHS.**"

Sealed the 5th January 1869, and dated the 29th August 1868.

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**PROVISIONAL SPECIFICATION** left by the said Cromwell Fleetwood Varley at the Office of the Commissioners of Patents, with his Petition, on the 29th August 1868.

I, CROMWELL FLEETWOOD VARLEY, of Beckenham, in the County of Kent, do hereby declare the nature of the said Invention for "**IMPROVEMENTS IN ELECTRIC TELEGRAPHS,**" to be as follows :—

This Invention has for its object improvements in electric telegraphs. For deep sea cables the insulated conductor is laid side by side and parallel, with a cord or cords and lashed at intervals thereto. The cords  
10 or ropes are made of hemp, jute, or other suitable fibre combining great strength with little or no weight in water. The effect of water upon hemp is to cause it to contract, and as cables have hitherto been

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constructed this contraction compels the core to contract also, and hence destruction of insulation by the protrusion of the conducting wires through the dielectric or insulator, in this cable any contraction of the strength giving ropes after submersion only causes the core to form festoons and does not therefore injure it. The core should be 5 previously covered with a slight serving to protect it against abrasion. The cord or rope may be composed partly of hemp and partly of iron or steel. The core (or insulated conductor) should be lashed to the cord, rope, or ropes at intervals of about one foot (more or less according to circumstances) unless they are twisted together in a slow spiral, in 10 which case the lashings may be dispensed with. In this way cables of great strength and very low specific gravity are formed at a very moderate cost, capable of being laid and recovered from the deepest known ocean. To preserve the hemp or other vegetable fibre used in these and other telegraphic cables or ropes it is first saturated with 15 strong brine or chloride of sodium and dried (wholly or partially) it is then covered with a mixture of pitch and chloride of sodium well mixed. To guard against the teredo or other boring insects of the warm oceans, the outer covering of the insulator is mixed with fine glass powder or other hard material detrimental to the teeth of the 20 marine animals. The pitch and chloride of sodium may be also mixed with the same hard powder. By the term pitch is included wood or mineral tar, wood or mineral pitch or resin; other chlorides, such as chloride of calcium, may be substituted for chloride of sodium in some cases with advantage, especially where the cable is to be laid under 25 ground. In the case of cables buried in the ground the chlorides also serve to prevent injury to the dielectric from vegetable growths.

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**SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said Cromwell Fleetwood Varley in the Great Seal Patent Office on the 27th February 1869.

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**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, CROMWELL FLEETWOOD VARLEY, of Beckenham, in the County of Kent, send greeting.**

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twenty-ninth day of August, in the 35

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year of our Lord One thousand eight hundred and sixty-eight, in the thirty-second year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Cromwell Fleetwood Varley, Her special licence that I, the said Cromwell Fleetwood Varley, my  
5 executors, administrators, and assigns, or such others as I, the said Cromwell Fleetwood Varley, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United  
10 Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN ELECTRIC TELEGRAPHS," upon the condition (amongst others) that I, the said Cromwell Fleetwood Varley, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should  
15 particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Cromwell Fleetwood Varley, do  
20 hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say :—

This Invention relates to the cables of electric telegraphs. Hemp, jute, and similar substances have been used for deep sea telegraphic  
25 cables, but as they have been hitherto constructed the contraction of these materials compels the insulated conductor to knuckle out and the conducting wire to protrude through the insulating material, and thus the insulation is destroyed. This defect may be remedied, as stated in my Provisional Specification, either by lashing the insulated conductor  
30 to the rope or ropes or twisting them together in a slow spiral. In practice I have not found the lashing process a good one, so I do not claim it, but adhere to the second alternative, namely, that of twisting the insulated conductor with the strands of the cable, so that the insulated conductor occupies the place of one of the spiral strands in an  
35 ordinary cable. Such a cable can be passed over the wheel of the paying-out and pulling-up machinery without injuring the insulated conductor, and any contraction of the comparatively elastic strands does not cause the conductor to knuckle out and endanger the insulation. The strands which, combined with the insulated conductor, constitute

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the cable are made of hemp or other similar fibre combining strength with little or no weight in water. The insulated conductor should be covered with a slight serving or with tape to protect it against abrasion.

The other part of my Invention relates to a method of preserving the hemp or similar vegetable fibre of telegraphic cables. To preserve the 5 hemp or similar vegetable fibre used in telegraphic cables or ropes it is first saturated with strong solution of either chloride of sodium or chloride of calcium, or a mixture of the two, and dried; it is then saturated with a mixture of pitch and chloride of sodium or calcium well mixed. In this term pitch are included wood or mineral tar 10 and wood or mineral pitch or resin.

And in order that my said Invention may be fully understood and readily carried into effect I will proceed to describe more in detail the manner in which I prefer to construct telegraphic cables.

The conductor which I prefer to employ is as usual a strand of copper 15 wires of a section adapted to the work which is required of it. It is insulated with a suitable thickness of gutta percha or caoutchouc as is well understood. In order to protect the insulator from abrasion I serve the insulated conductor with common serving or with tape. I next take two hempen cords or ropes; they may conveniently be of 20 rather larger diameter than the served insulated conductor. I lay together the two cords and the insulated conductor in a very slow spiral, say with one turn of the lay in a length equal to thirty diameters of one of the cords, as shown in the Drawing hereunto annexed. Before laying them together I usually submit the cords to the preservative process 25 which constitutes the second part of my Invention. It is not absolutely essential that they be submitted to this process which is principally used for the purpose of retarding decay. For preserving the vegetable fibre in telegraphic cables I soak the cords in brine until they are thoroughly saturated, and I then dry them at a gentle heat. I then saturate them 30 with a mixture of pitch, as above defined, and pulverized chloride of sodium in such proportions that the compound will neither run nor become hard at any temperature to which the cable will be exposed. It is difficult to state any fixed proportions, as the pitch and tar of commerce vary in quality, but a compound of about forty-five parts of 35 pitch, thirty-five parts of tar, twenty parts of chloride of sodium or calcium, will usually be sufficient.

What I claim is the constructing electric telegraphic cables by twisting

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an insulated conductor with a cord or cords of hemp or other similar fibrous material, as herein-before described.

I also claim the use in the manufacture of telegraphic cables of cords, yarns, or tape impregnated by chloride of sodium or calcium, 5 and then coated with pitch and chloride of sodium or calcium, as herein described.

10 In witness whereof, I, the said Cromwell Fleetwood Varley, have hereunto set my hand and seal, this Twenty-fifth day of February, in the year of our Lord One thousand eight hundred and sixty-nine.

CROMWELL F. VARLEY. (L.S.)

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LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty. 1869.



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VARLEY'S SPECIFICATION.

(1 SHEET)



*The filed drawing is not colored.*

Drawn on Stone by Malby & Sons.

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